WHAT IS CLAIMED IS:

1. A wave energy converter (WEC) comprising:

a shell mounted about a **piston** forming a combination which when placed in a body of water is responsive to waves in the body of water for producing relative motion between the shell and the piston;

a mechanical motion to electrical energy converter, including an electric generator, responsive to the relative motion between the shell and the piston for producing at an output of the electric generator at least **one of a voltage and current** which is a function of the relative motion; and

means coupling a load to the output of the electric generator, said load having an impedance whose value is a function of the period of the waves and of the mass of the water in the shell.

2. A WEC as claimed in claim 1, wherein the impedance of said load is approximately equal to $1/(\omega)(C_E)$ for optimizing the generator power output; where:

ω is equal to the angular frequency of the waves expressible as $2\pi/T$ where T is the period of the waves; and

C_E is approximately equal to M_T/K, where M_T is approximately equal to the mass of the shell and the mass of the water moved by the shell and K is an electromechanical coupling constant.

3. A WEC as claimed in claim 2 wherein one of the shell and the piston is relatively stationary and the other one of said shell and piston moves in response to said waves.

4. A WEC as claimed in claim 3, wherein the mechanical motion to electrical converter includes a motor which is responsive to mechanical forces due to said relative motion between the shell and the piston for driving the electric generator and producing electrical energy proportional to said relative motion, which electrical energy is applied to said load.

5. A WEC as claimed in claim 4 wherein said load is primarily resistive.

6. A WEC as claimed in claim 5 wherein the portion of the WEC producing a voltage at the output of the electric generator exhibits one of an inductive and capacitive reactance, and wherein said means coupling the load to the output of the electric generator includes a reactive element exhibiting the other one of an inductive and capacitive reactance for enhancing the generation of a resonant condition in the power generation of the WEC.

7. A WEC as claimed in claim 6 wherein the equivalent impedance of the shell and piston and the mechanical motion to electrical energy converter is primarily capacitive and wherein the reactive element coupling the load

to the output of the converter includes an inductive element (L) whose reactance (ωL) is approximately equal to the reactance $[1/(\omega)(C_E)]$ exhibited at the output of the electric generator for enhancing the generation of a resonant condition.

8. A WEC as claimed in claim 3 wherein the shell has a tubular shape and the piston moves up and down within the tubular enclosure.

9. A WEC as claimed in claim 7 further including a controller for varying the impedance of the load for maintaining the value of the load seen by the generator equal to an optimum value (R_{LOPT}) for optimum power transfer.

10. A WEC as claimed in claim 7 further including a controller for varying the inductive element for maintaining the system in resonance as a function of changes in at least one of the amplitude, frequency and phase of the waves.

11. A WEC as claimed in claim 7 wherein said inductive element includes at least two different inductive components switchably interconnected to selectively increase or decrease the inductance in the power loop.

12. A WEC as claimed in claim 7 further including a sensor for sensing at least one of the conditions of the waves and the status of the WEC system and a controller responsive to signals from the sensor for varying the values of at least one of the load and the inductive element for maintaining an optimum value of load and enhancing resonance of the system.

13. A WEC as claimed in claim 1 including a sensor ,a controller, and an AC to DC converter and means for controlling the effective impedance of the load as a function of variations in the waves.

14. A WEC as claimed in claim 1 wherein the electrical generating portion of the WEC exhibits inductive characteristics and wherein the means coupling the load to the output of the converter includes a capacitive element for enhancing a resonant condition in a series loop including the electric generation portion of the WEC, the load and the capacitive element.

15. A WEC as claimed in claim 14 further including a controller for varying the capacitive element for maintaining the system in resonance as a function of changes in at least one of the amplitude, frequency and phase of the waves.

16. A WEC as claimed in claim 14 wherein said capacitive element includes at least two different capacitive components switchably interconnected to selectively increase or decrease the capacitance in the power loop.

17. A WEC as claimed in claim 14 further including a sensor for sensing the peak conditions of the waves and a controller responsive to signals from the sensor for varying the values of at least one of the load and the capacitive element for maintaining an optimum value of load and enhancing resonance of the system.

18. A WEC as claimed in claim 6, further including a controller for varying at least one of the effective resistance of the load and the impedance of the element coupling the load to the electric generator for optimizing power transfer and maintaining resonance, and further including sensor means for sensing selected points in the power generation loop and producing signals applied to the controller for varying the load and the impedance of the coupling element.

19. A wave energy converter (WEC) comprising:

a structure which when placed in a body of water includes mechanical parts which move and drive an electric generator in response to waves in the

body of water for producing at an output of the electric generator a voltage which is a function of the motion induced by the waves;

wherein the portion of the structure generating a voltage at the output of the electric generator exhibits one of an inductive and capacitive reactance;

a load coupled to said output of the electric generator having an impedance whose value is a function of the period of the waves and of the mass of the water and structure which move; and

a reactive component coupled to the output of the electric generator in series with the load, said reactive component being selected to be the other one of said inductive and capacitive reactance for enhancing resonance in the WEC.

20. A power generating system comprising:

a structure which includes mechanical parts which move and drive an electric generator when the structure is subjected to naturally recurring forces for producing at an output of the electric generator a voltage which is a function of the motion induced by the naturally recurring forces;

wherein the portion of the structure generating a voltage at the output of the electric generator exhibits one of an inductive and capacitive reactance;

a load coupled to said output of the electric generator having an impedance whose value is a function of the period of the naturally recurring force and of the mass being moved; and

a reactive component coupled to the output of the electric generator in series with the load, said reactive component being selected to be the other one of said inductive and capacitive reactance for enhancing resonance in the power generating system.

21. A method for optimizing the power transfer in a system including a wave energy converter (WEC) comprising a shell mounted about a piston forming a combination which when placed in a body of water is responsive to waves in the body of water for producing relative motion between the shell and the piston and further including a converter including an electric generator for converting the mechanical motion to produce electric energy at an output of the converter comprising the steps of:

(a) determining $1/\omega C_E$; where:

ω is equal to the angular frequency of the waves expressible as $2\pi/T$ where T is the period of the waves; and

C_E is approximately equal to M_T/K , where M_T is equal to the mass of the shell and the mass of the water moved by the shell and K is an electromechanical coupling constant; and

(b) selecting a load having a value approximately equal to $[1/\omega C_E]$ and coupling the load to the output of the converter.

22. A method as claimed in claim 21, further including the step of determining the value of an inductive element coupling the load to the output of the converter for inductively tuning the load at, or near, the dominant wave frequency, the reactance (ωL) of the inductive element having a value approximately equal to $1/\omega\, C_E$.

23. In combination with a wave energy converter (WEC) system designed to be placed in a body of water having waves exhibiting variation in amplitude, frequency and phase and in which the energy of the waves is converted to electrical energy and wherein the electrical energy is applied to a load, the improvement comprising:

setting the initial value of said load to have an impedance whose value is a predetermined function of the average period of the waves and of the mass of the water in the WEC; and

means for varying the impedance of the load as a function of changes in at least one of the frequency, amplitude and phase of the waves providing the input power to the WEC system for maintaining the impedance of the load at a predetermined optimum value.

24. In the combination as claimed in claim 23, wherein the electrical energy is applied to the load via an inductive element having a value to tend to cause resonance in a loop which includes components coupling the electric energy to the load.

25. In combination with a wave energy converter (WEC) system designed to be placed in a body of water having waves and in which the energy of the

waves is converted by means including an electric generator to electrical energy and wherein the electrical energy is applied to a load, the improvement comprising:

reactive means coupled between an output of the electric generator and the load for causing the output of the electric generator to resonate with the total mass moved (M_T).

26. In the combination as claimed in claim 25 wherein the load has a value approximately equal to $1/\omega C_E$; where:

ω is equal to the angular frequency of the waves expressible as $2\pi/T$ where T is the period of the waves; and

C_E is approximately equal to the total mass moved (M_T) which includes Mwc/K and the mass of the WEC, where Mwc is approximately equal to the mass of the water within the WEC and K is an electromechanical coupling constant.

27. In the combination as claimed in claim 26 wherein the reactive means is an inductive component whose impedance (ωL) has a value approximately equal to $1/\omega C_E$.